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A FIELD EMISSION DISPLAY WITH LOW WORK FUNCTION EMITTERS

GOVERNMENT RIGHTS

[0001] This invention was made with government support under Contract No. DABT 63-93-C0025 awarded by Advanced Research Projects Agency (ARPA). The government has certain rights in this invention.

CROSS-REFERENCE TO RELATED APPLICATIONS

[0002] This application is a divisional of United States Patent Application Serial No. 09/105,613, filed June 26, 1998, now U.S. Patent 6,057,638, issued May 2, 2000, which is a divisional application of United States Patent Application Serial No. 08/543,819, filed October 16, 1995, now U.S. Patent 5,772,488, issued June 30, 1998, the contents of which are hereby expressly incorporated by reference for all purposes.

BACKGROUND OF THE INVENTION

[0003] This invention relates to field emission displays and, more particularly, to the formation of low work function emitters.

[0004] The required turn-on voltage for an emitter at a constant current is a function of the work function of the material at the surface of the emitter. For example, see U.S. Patent No. 4,325,000, issued April 13, 1982, incorporated herein by reference, and H.B. Michaelson, "Relation Between An Atomic Electronegativity Scale and the Work Function," 22 IBM Res. Develop., No. 1, Jan. 1978. Reduction of the work function of a material can be achieved by coating the surface with an electropositive element. For example, see U.S. Patent No. 5,089,292, incorporated herein by reference. However, such knowledge has never been translated into a useful field emission display. Electropositive materials are very reactive and, therefore, upon coating on an emitter, they quickly begin to react with most atmospheres, resulting in a high work function material coating the emitter. Accordingly, emitters coated with low work function materials on the surface have traditionally not been useful. Also, the compositions in which electropositive elements normally exist (for example, as a salt with Cl) include elements that have a very large work function (e.g., Cl).

[0005] The present invention provides solutions to the above problems.